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Title: DOE Nuclear Criticality Safety Program (NCSP) Review, Integral Experiments Program Element

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DOE Nuclear Criticality Safety Program (NCSP) Review

Integral Experiments Program Element

Las Vegas March 24, 2004

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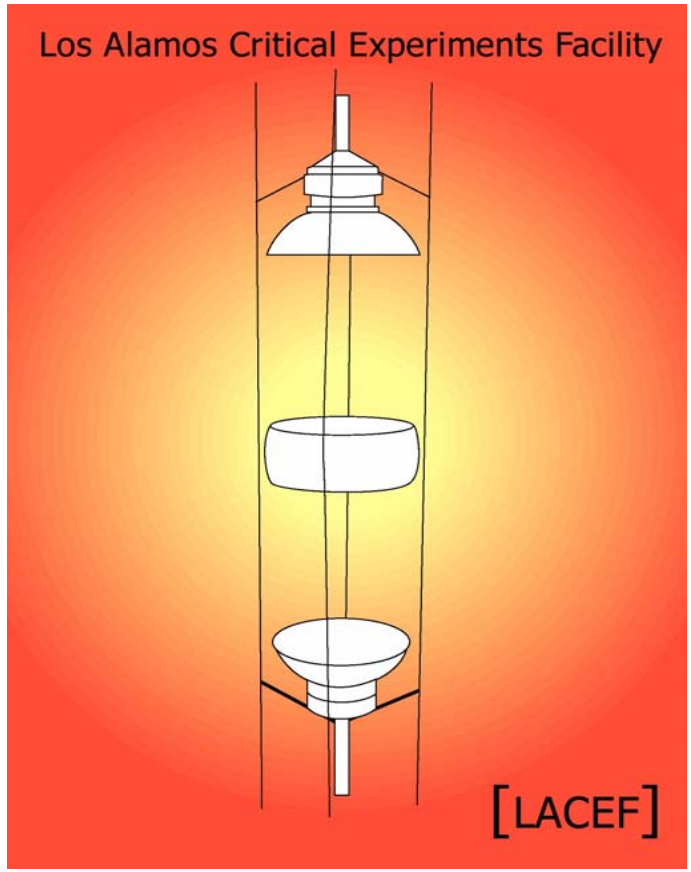
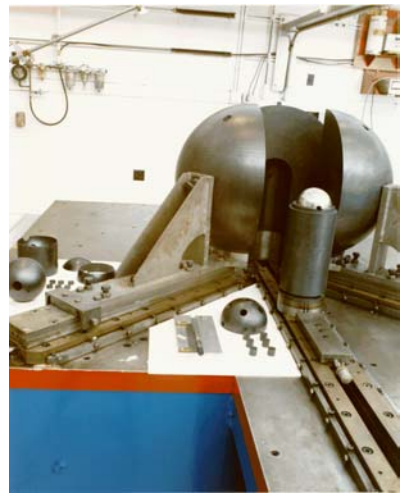
Outline

- **Integral Experiments Program Element within the NCSP**
- **Operational Status of LACEF**
- **FY04 Accomplishments**
  - Completed experiments
  - Completed benchmark evaluations
- **Plans for FY05**
  - Planned experiments
  - Planned benchmark evaluations
- **Other significant events/impacts**
  - Update on TA-18 mission relocation



Current Critical Assembly Machine Status

- **Godiva IV** — Operable
- **Flattop** — Operable
- **Comet** — Operable
- **Planet** — Operable
- **SHEBA** — Operable



Significant Events of the Past Year
October 2003 – March 2004

- **Implementation of new Documented Safety Analysis (DSA)**
  - Technical Safety Requirements (TSRs)
    ITMS on Hold for Independent Design Review
- **Completion of Benchmarks**
  - Six committed to the NCSP – all six completed
- **Completion of all criticality safety classes**
- **Significant new interest in performing experiments on Godiva from weapons programs and intelligence programs**
- **NASA interest in JIMO support**

FY04 Accomplishments

- **Experiments proposed for this FY in the 5-Year Plan**
  - Z005 Comet/Zeus, Fe^{2}/HEU/Fe^{2} — Completed
  - Z006 Comet/Zeus, Fe^{3}/HEU/Fe^{3} — Completed
  - Z007 Comet/Zeus, Al^{1}/HEU/Al^{1} — Possible in FY04
  - Z008 Comet/Zeus, Al^{2}/HEU/AL^{2} — Possible in FY04
  - NP001 ^{237}Np/HEU bare — Completed
  - NP004 ^{237}Np/HEU/Poly reflected — Possible in FY04
  - NP007 ^{237}Np/HEU/Fe reflected — Completed
  - P012 1x1 HEU/CaO/Poly — Possible in FY04
  - P013 1x1 HEU/Zr/Poly — Possible in FY04
  - P014 Component Benchmark — Possible in FY04
  - P015 1x1 HEU/Concrete/Poly — Completed
  - SM1 HEU/Graphite — Possible in FY04
  - SUB2 Np Bare and Reflected by HEU — Completed

FY04 Accomplishments

- **NASA**
  - JIMO – Rhenium
- **Work for Others**
- **Godiva**
  - C-INC
  - EMF
  - Dosimetry
- **SHEBA**
  - Burst Preparation

ICSBEP Benchmark Evaluations Committed to in FY04

- **HEU-MET-THERM-012**
  - P009, Planet Waste Matrix HEU/Al/Poly (2x2 array)
- **HEU-MET-THERM-018**
  - P015, Waste Matrices HEU / Concrete / Poly
- **HEU-MET-INTER-006**
  - Z001/Z002/Z003, Zeus HEU Intermediate Energy Spectrum with Graphite (Addendum)
- **HEU-MET-FAST-072**
  - Z005/Z006 ZEUS (HEU) Intermediate Energy Spectrum with Iron (Fe)
- **SPEC-MET-FAST-014**
  - NP007, Neptunium/HEU Reflected with Steel
- **SUB-SPEC-MET-FAST-001**
  - SUB2, Bare and HEU Reflected Np-237 Spheres

Five Year Plan

LACEF Experiments Section of the NCSP 5-Year Plan

FY 2004 ($k) 1372	FY 2005 ($k) 1400	FY 2006 ($k) 1450	FY 2007 ($k) 1700	FY 2008 ($k) 1800	FY2009 ($k) 1600
NP004 Np/HEU/Poly (Planet)	NP002 Continue ^{237}Np critical mass experiment Np/HEU/NU reflected (Planet)	P019 Pu(δ)/HEU (Planet)	NP006 Np/HEU/W (Planet)	P029 HEU Reflected Poly (Planet)	NP005 Np/HEU/Be (Planet)
NP007 Np/HEU/Steel (Planet)	NP003 Np/HEU/Be (Planet)	P026 HEU bare (Planet)	P028 HEU Reflected W (Planet)	P030 HEU Reflected Steel (Planet)	P031 HEU Reflected Be (Planet)
P012 1x1 HEU/CaO/Poly (Planet)	P016 2x2 Concrete/HEU/Poly (Planet)	P027 HEU NU Reflected (Planet)	SM3 HEU/Be (Planet)		
P013 1x1 HEU/Zr/Poly (Planet)	P017 1x1 HEU/Al_2O_3/Poly (Planet)	SM5 Pu(δ) D_2O Reflected (Planet)			
P014 Component Benchmark (Planet)	P018 2x2 HEU/Al_2O_3/Poly (Planet)				
P015 1x1 Concrete/HEU/Poly (Planet)	SM2 HEU/D_2O (Planet)				
SM1 HEU/Graphite (Comet)	SM4 Pu(δ) Graphite Reflected (Planet)				
SUB2 ^{237}Np Bare and Reflected by HEU (Planet)	SM6 Pu(α) Be Reflected (Planet)				
P019 Pu(δ)/HEU (Planet)	Z008 Comet/Zeus, Al^2/HEU/Al^2 (Comet)				
Z006 Comet/Zeus, Fe^3/HEU/Fe^3 (Comet)	Z009 HEU/Gd Alloy (if Gd Alloy becomes available) (Comet)				
Z007 Comet/Zeus, Al^1/HEU/Al^1 (Comet)	Z013 SiO_2^1/HEU/SiO_2^1 (Comet)				
NASA , JIMO, Nb/HEU (Comet/Planet)	Z014 SiO_2^2/HEU/SiO_2^2 (Comet)				
WFO (Comet)					
C-INC, NIS-10, HSR-4 (Godiva)	C-INC, NIS-10, HSR-4 (Godiva)				
SHEBA UO_2F_2 Burst Prep	SHEBA UO_2F_2 Burst Mode	SHEBA UO_2F_2 Burst Mode	SHEBA $UO_2(NO_3)_2$	SHEBA $UO_2(NO_3)_2$	SHEBA $UO_2(NO_3)_2$

Proposed ICSBEP Evaluations

- **HEU-MET-THERM-015**
  - P007/P008, Planet Waste Matrix HEU-Fe (2x2 array) 15-mil thick iron plates
- **HEU-MET-THERM-017**
  - P012, Waste Matrices HEU / Ca / Poly
- **HEU-MET-INTER-010**
  - Z007/Z008 ZEUS (HEU) Intermediate Energy Spectrum with Aluminum (Al)
- **HEU-MET-INTER-011**
  - SM1, Special Moderator HEU/Graphite
- **MIX-MET-FAST-013**
  - P011, Bare Pu(α) / HEU
- **SPEC-MET-FAST-009**
  - NP001/NP002 Neptunium/HEU Critical (natural uranium reflected)

Current List and Status of Priority Experiments

JUNE 1998 RECOMMENDATIONS FOR PRIORITY OF CRITICAL EXPERIMENTS

PRIORITY	1998 IDENTIFIER	1994 IDENTIFIER	EXPERIMENT DESCRIPTION	RELATIVE PRIORITY	RELATIVE COST	BENEFITS ACRUE TO	STATUS	
1	98-2, 98-4, 98-6, 98-14, 98-28	107, 502i, 603, 609	Intermediate energy spectrum (ZEUS)	HIGH	LOW	DP, EM, MD, RW	Active	
2	98-6, 98-14, 98-2, 98-4	102, 502a, 702, 502g, 303	Fast, intermediate, and thermal energy spectrum with fissile / fissionable material in waste matrices	HIGH	MEDIUM	EM, MD, RW	Active	
3	98-7	206, 207, 102 502a, 702	Reactivity and replacement measurements with SHEBA (CERES, ^{233}U, MOX, etc)	HIGH	LOW	RW, EM, NRC	On hold	
4	98-1	None	Component safety benchmark experiments	HIGH	MEDIUM	DP, DoD	Active	New for FY03
5	98-22, 98-3, 98-16, 98-21, 98-23	301, 503, 504	Criticality accident simulation/equipment and methodology qualification	MEDIUM	LOW	DP, EM, MD, RW	Active	New for FY03
6	98-8, 98-9, 98-10, 98-13, 98-18, 98-19	601, 605, 605a, 605b, 401	Critical mass measurements and neutron parameters for actinide isotopes	MEDIUM	MEDIUM	DP, EM, MD, RW	Active	
6a			Thermal and intermediate energy experiments with gadoliniated alloy and HEU				Active	New for FY03
7	98-8	None	Lattice experiments with MOX fuel pins	MEDIUM	MEDIUM	RW, MD, DP NRC		
8	98-11	707, 304	Special moderators, situations, & anomalies (Be, BeO, D_2O, etc)	MEDIUM	MEDIUM	EM, MD, RW, DP	Active	New for FY03
9	98-5, 98-20, 98-21	601, 301, 303	Static benchmark experiments in fissile solutions	HIGH	VERY HIGH	DP, EM		
10	98-27	505, 701	Source jerk, pulsed neutron measurements for subcritical systems	HIGH	MEDIUM	DP, EM, EH, RW, NRC	Active	

Update on TA-18 Mission Relocation